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Microsoft Interoperability Track
Exchange Server Protocols Overview

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Agenda

- Open Specifications Introduction
- Exchange Protocols scope
- Exchange Protocols details
- Choice of protocols to use
- Resources
OPEN SPECIFICATION: BRIEF INTRODUCTION
Introduction to Open Specifications

• Normative language
  • Designed to document bits over the wire
  • No APIs – only Protocols
  • MUST, SHOULD, MAY and endnotes are used to document version-specific behavior. Follows RFC 2119.
  • Strict document structure

• Windows/Exchange or product API knowledge not required...
  • Microsoft Products are not mentioned in normative content, only in endnotes and Overview documents

• Open Specifications document on-premises Exchange Server protocols
Open Specifications Highlights

• Endpoints
  • Most Exchange documents focus on Server endpoint (Server behavior)
  • Some documents prescribe Client endpoint behavior quite extensively (Outlook)
• Product Versions
  • Implementation choice for different releases (product versions) is stated in the Appendix using endnotes
• Example: Endnote clarifying version-specific behavior

2.2.1.56.2 PidTagNativeBody Property
...
The PidTagNativeBody property ([MS-OXPROPS] section 2.805) indicates the best available format for storing the message body<6>

6 Appendix A: Product Behavior
...
<6> Section 2.2.1.56.2: Exchange 2003 and Exchange 2007 do not support the PidTagNativeBody property.
EXCHANGE PROTOCOLS: WHAT’S IN SCOPE
EXCHANGE PROTOCOLS: DETAILS
Glossary

• **RPC** – Remote Procedure Call
• **ROPs** – Remote Operations
• **MAPI** – Mail API, since 1990th. Originally library used by Outlook for Windows Desktop. Protocol family: **RPC/ROPs**
• **MAPIHTTP** – ROPs over HTTP instead of RPC
• **EWS** – Exchange Web Services (protocol family)
• **EAS** – Exchange Active Sync (protocol family)
Client communication with Exchange Server

Exchange Server

- Smartphone/Tablet
- Outlook for MAC
- Outlook for Windows Desktop
- POP/IMAP Client

EAS
EWS
ROPs
NSPI
MAPIHTTP
POP/IMAP
SMTP

Storage
- Mailbox store
- Public store
- OAB

Active Directory

SMTP Server
There is more to Exchange than email

<table>
<thead>
<tr>
<th>Category</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendars</td>
<td>Recurring meetings, cross time zone scheduling</td>
</tr>
<tr>
<td></td>
<td>Availability – both attendees and conference rooms</td>
</tr>
<tr>
<td>Tasks</td>
<td>One-time or recurring</td>
</tr>
<tr>
<td></td>
<td>Tracking Due Date and Assignment</td>
</tr>
<tr>
<td>Contacts</td>
<td>Multiple Contacts Folders, Suggested Contacts</td>
</tr>
<tr>
<td></td>
<td>Address book for mobile devices</td>
</tr>
<tr>
<td>Reminders</td>
<td>For Calendars, Tasks, Emails</td>
</tr>
<tr>
<td>Notifications</td>
<td>Server notifies Client that mailbox changed (new mail, etc.)</td>
</tr>
<tr>
<td></td>
<td>Push or Pull</td>
</tr>
</tbody>
</table>
There is more to Exchange than email

<table>
<thead>
<tr>
<th>Rules</th>
<th>Server Side and Client Side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Applied on messages on arrival, even when client is not connected</td>
</tr>
<tr>
<td>Out of Office</td>
<td>Internal and External recipients can get different OOF messages</td>
</tr>
<tr>
<td></td>
<td>Time restrictions</td>
</tr>
<tr>
<td>Mail Tips</td>
<td>Show user that recipient is Out of Office</td>
</tr>
<tr>
<td></td>
<td>Warning that mail includes very large DL, etc.</td>
</tr>
<tr>
<td>Compliance</td>
<td>Legal Search (eDiscovery)</td>
</tr>
<tr>
<td></td>
<td>Legal Hold</td>
</tr>
<tr>
<td>Archiving</td>
<td>Separate Archive for old emails, accessible by client</td>
</tr>
<tr>
<td></td>
<td>Retention policies set per folder</td>
</tr>
<tr>
<td>And so on...</td>
<td></td>
</tr>
</tbody>
</table>
Overview Document: MS-OXPROTO

- Defines protocol families
- Scenario-Based
  - How protocols work together
- Walkthroughs and examples
  - Display an e-mail
  - Send an attachment
  - Create an appointment
  - ... and other scenarios
# Protocol Families

- **ROP Protocols**
  - Originally RPC transport
  - HTTPS transport introduced in Exchange 2013
  - NSPI is used for Address Book access
- **Exchange Web Services (EWS)**
- **ActiveSync (EAS)**
- **Other protocol groups**
  - Autodiscover
  - Content Conversion
  - Standards Support
EXCHANGE PROTOCOLS: ROP PROTOCOLS
History of terminology – what is “ROP”?

• Initial name: RPC protocols
  • Remote Operations (ROPs) over RPC connection
  • RPC is just a channel to exchange binary blobs between client and server
  • This binary blob can be transmitted by other underlying protocols
    - RPC over TCP or RPC over HTTPS (MS-OXCRPC)
    - Pure HTTPS (MS-OXCMAPIHTTP)

• MAPIHTTP is RPC replacement (Exchange Server 2013)
  • The same binary blob is now transmitted over HTTP, bypassing RPC

• Since it’s not RPC anymore, we now call them ROP Protocols
  • In many places it is still called “Exchange RPC protocols”, sometimes MAPI
ROP Protocols Details

- Transport layers: RPC/TCP, RPC/HTTPS or pure HTTPS
- Low-level access to Exchange Server Storage
  - Optimized to minimize traffic on the wire
  - Very complex parsing
- Used by MAPI
  - Major channel for Outlook for Windows Desktop communication with Exchange Server
- Originally implemented in Exchange 4.0 (first release of Exchange)
  - Extended and re-architected several times
ROP Protocols Documentation

- ROPs protocols define both Server and Client behaviors
- Client behaviors are very complex
  - Wrapped in MAPI implementation on Outlook for Windows Desktop
  - Client performs logic to maintain complex items: Messages, Folders, Calendar, Contacts, Tasks, etc...
- Document Naming: [MS-OXO*] and [MS-OXC*]
- Over 40 Protocols, ~3000 pages
Example of complexity in ROP Protocols

Note: No ROP Data size or end marker. Every ROP Data in the blob must be parsed. Every RopID has different ROP Data structure. Number of documented RopIDs: 130+
Where to start: ROP Protocols
ROP Protocols Summary

- Not recommended for new applications due to complexity
- Modern Exchange Server has good alternatives
  - Exchange Web Services for On-Prem Server
  - Microsoft Graph for Exchange Online
EXCHANGE PROTOCOLS:
EXCHANGE WEB SERVICES (EWS)
EWS Protocols: Details

- Alternative to ROP protocols
- Higher level of abstraction compared with ROP protocols
  - EWS implements messages, attachments, calendar events, contacts on server side
  - Outlook for Windows Desktop uses subset of EWS protocols
    - Unified Messaging, MailTips, Availability, OOF, Office Apps, Room List, Archive, Mailbox Policies, Calendar Sharing, Site Mailboxes, etc.
  - Intuitive/readable XML (easier troubleshooting)
- Transport: SOAP over HTTP(S)
EWS Protocols: Documentation

- Code in any language/platform that supports HTTP/SOAP calls
  - SDKs are available as well
- Document Naming: [MS-OXW*]
  - 43 Protocols, ~2000 pages
- First implementation: Exchange Server 2007
- New on-prem features tend to be implemented in EWS
Where to start: EWS

- Not hierarchical
- Start with MS-OXWSCORE
EWS SDKs

• Exchange Web Services (EWS) Managed API
  • https://www.nuget.org/packages/Microsoft.Exchange.WebServices
  • https://github.com/OfficeDev/ews-managed-api
EXCHANGE PROTOCOLS: EXCHANGE ACTIVE SYNC (EAS)
Exchange ActiveSync: Protocols Details

- Lightweight synchronization protocol for Exchange Server
  - Optimized to work on high-latency and low-bandwidth networks
  - Designed to minimize device power usage
- High level of abstraction, similar to EWS in complexity
  - Provides access to email, calendar, contacts, tasks, documents, etc...
- Transport Layer: WBXML over HTTPS
- Industry standard
  - Several non-Exchange Server implementations
  - Wide range of clients – iOS, Android, Windows, etc.
Exchange ActiveSync: Protocols Documentation

- Document Naming: [MS-AS*]
  - 15 Protocols; ~900 pages
- First Implementation: Exchange Server 2003
Where to start: Exchange ActiveSync
Typical Usage of Exchange ActiveSync

• Mobile Applications
• Tablets and lightweight desktop applications
  • Allows for low-bandwidth and high-latency data (Internet) connections while scaling reasonably on high-speed connections.
• Additional considerations
  • Not feature parity with Exchange ROPs and Web Service (EWS) protocols
  • Licensing requirements
CHOICE OF PROTOCOLS TO USE
On-Premises Choice

- EWS is recommended for new applications
- ROPs protocols are very complex
- EAS has special purpose
Exchange Online choice: Graph APIs

- If you develop for Microsoft 365, consider Microsoft Graph APIs
  - Modern authentication
  - Seamless integration with other services (SharePoint, OneDrive, Azure, etc.)
  - New Exchange Online features are implemented in Microsoft Graph APIs
Microsoft Graph APIs Starting Points

- Microsoft Graph Dev Center | APIs and app development
Exchange Protocol Test Tools

• Protocol Test Suites
  • Protocol families: EAS, EWS, and ROPs (RPC/MAPIHTTP)

• Fiddler Inspectors:
  • Protocol families: ROPs (MAPIHTTP)
Exchange Protocol Resources

- All Exchange protocol documents

- Office Interoperability Blog:

- Protocol Test Suites
  - https://github.com/OfficeDev/Interop-TestSuites

- Fiddler inspectors for Office and Exchange protocols
  - https://github.com/OfficeDev/Office-Inspectors-for-Fiddler

- Help with Open Specifications:
  - mailto:dochelp@microsoft.com
Thank you!